

P. EMDEN.
BLADE FOR TURBINES.
APPLICATION FILED OCT. 23, 1907.

913,273.

Patented Feb. 23, 1909.

2 SHEETS—SHEET 1.

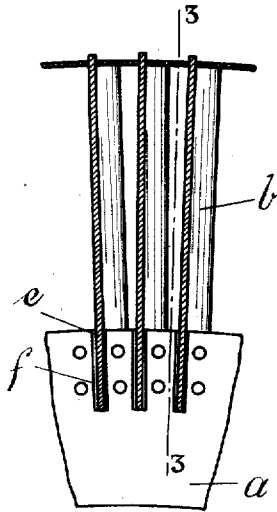


Fig. 2.

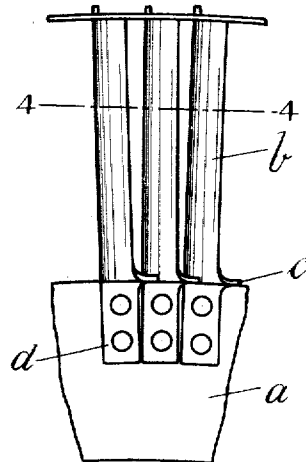


Fig. 1.

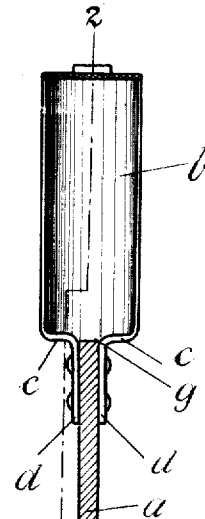


Fig. 3.

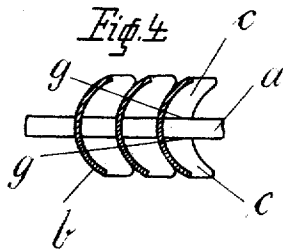


Fig. 4.

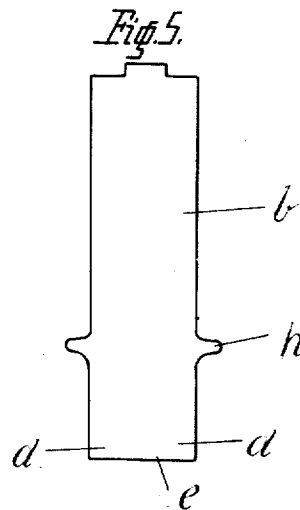


Fig. 5.

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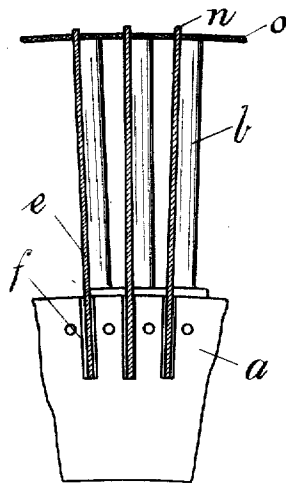


Fig. 7.

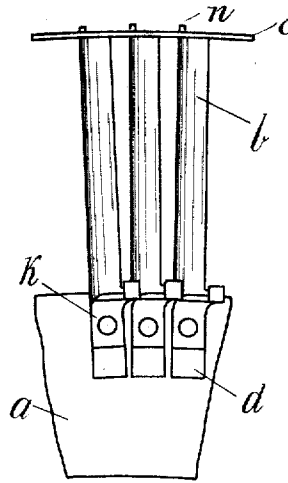


Fig. 6.

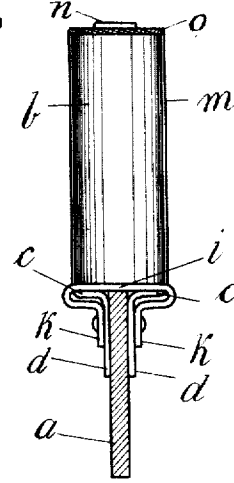


Fig. 8.

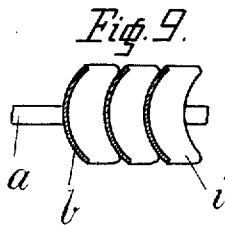


Fig. 9.

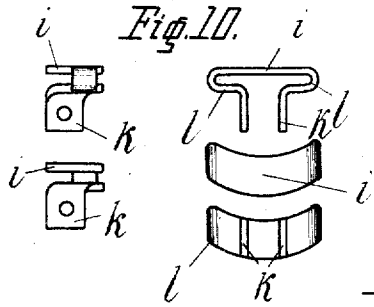


Fig. 10.

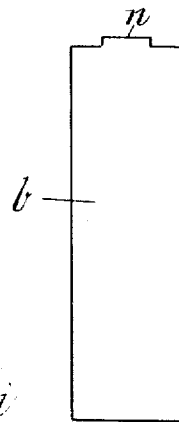


Fig. 11.

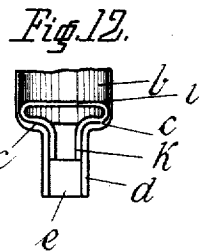


Fig. 12.

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BLADE FOR TURBINES.

No. 913,273.

Specification of Letters Patent.

Patented Feb. 23, 1909.

Application filed October 23, 1907. Serial No. 398,895.

To all whom it may concern:

Be it known that I, PAUL EMDEN, a subject of the Republic of Switzerland, and a resident of Berlin, Germany, have invented certain new and useful Improvements in Blades for Turbines, of which the following is a specification.

My invention relates to turbines, and has for its object to improve the fastening of blades to the turbine disk or wheel so that leakage of steam may be avoided at the points where the blades engage the turbine disk.

Another object of my invention is to reduce the cost of manufacturing the blades by giving them a form which allows them to be stamped, with no waste of material.

In the accompanying drawings, Figures 1 to 5 illustrate an old construction and Figs. 6 to 12 show my present improvement. Fig. 1 is a side view of a portion of the turbine; Fig. 2 is a section on line 2—2 of Fig. 3; Fig. 3 is a cross section on line 3—3 of Fig. 2; Fig. 4 is a horizontal section on line 4—4 of Fig. 1, and Fig. 5 is a developed view of the old blade; Figs. 6, 7, 8 and 9 are views corresponding to Figs. 1, 2, 3 and 4 respectively, but showing the new construction. Fig. 10 represents a packing member in side view, front view, vertical section, top view, and bottom view; Fig. 11 shows the new blade in developed view, front view, side view, top view, and horizontal section through the lower part; and Fig. 12 is a front view of a slightly different blade fastening.

The customary construction illustrated by Figs. 1 to 5 comprises a disk *a* and blades *b* the inner portions of which have bottom flaps *c* and plates *d* which latter were riveted against the faces of the disk *a* as shown best in Fig. 3. The webs *e* between the plates *d* could be left entire, in which case the disk *a* was provided with slits *f* as shown in Fig. 2, to receive said webs. The drawback of this construction was that at the points *g* (Fig. 4) where the bottom flaps *c* of the blades engaged the disk *a*, the steam could leak toward the axis of the turbine. Furthermore, the flaps *c* of adjacent blades had to be in contact with each other so as to secure a steam-tight fit, and for this purpose lugs *h* had to be provided on the blade

blanks (Fig. 5), so as to entail considerable waste of material.

According to my present invention, the defects mentioned above are avoided by the use of a special packing member and by giving the blade a new shape. The manner of fastening the blades *b* with their bottom flaps *c* and plates *d* to the disk *a* may be the same as above described, the disk having slits *f* for the webs *e*, in case the blades are made with such webs. To prevent the steam from leaking through at the edges *g* (Fig. 4) I employ packing members or packing plates *i* (Figs. 9 and 10) which entirely cover the base of each blade. In order to securely fasten the packing members to the blades or disks, the said members are provided with return bends *l* and with depending lugs *k*. These packing plates (being more or less T-shaped when bent) are simply slipped on the bottom flaps *c* of the blades and riveted to the disk *a* by the same rivets which fasten the plates *d*. In view of the fact that the packing members produce a perfectly tight joint at the bottom flaps *c*, the latter may be made narrower than in Fig. 4, so that the blades may be stamped from a rectangular piece of sheet metal, (Fig. 11).

The manner of fastening the packing members, as well as their form, may be varied considerably. The lugs *k* may be omitted, the bends *l* of the packing members in this case simply straddling the bottom flaps *c*. As shown in Fig. 12, the lugs *k* may be arranged to come between the fastening plates *d* of the blades.

When employing the manner of fastening shown in Fig. 8, it is advisable to have the edges of the flaps *c* and those of the bends *l* within the lines of the blade edges *m*, so that in case the blades should rub and wear, the bends *l* may not be exposed to wearing through at the same time. The outer ends of the blades *b* may be provided with projections *n* to fit openings in a holding ring *o*.

I claim as my invention:

1. The combination of the disk, the blade having a bottom adjacent to the disk, and the packing member for producing a tight joint at the bottom of the blade.
2. The combination of the disk, the blade having bottom flaps at the peripheral por-

tion of the disk, and the packing member arranged in engagement with said bottom flaps.

3. The combination of the disk, the blade
5 having bottom flaps at the peripheral portion of the disk and fastening plates on opposite sides of the disk, and the packing member engaging said flaps and provided with lugs in engagement with said fastening
0 plates.

4. Bucket blades fixed at the periphery of

a wheel and shields placed astride on the wheel interposed between consecutive buckets.

In testimony whereof, I have hereunto set 15
my hand in the presence of two subscribing witnesses, this 25th day of September, 1907.

PAUL EMDEN

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.